The challenge of healthy, sustainable diets: the journey from foods to nutrition

Anneleen Kuijsten & Pieter van ‘t Veer

23rd April, Brussels, Belgium

WAGENINGEN UNIVERSITY
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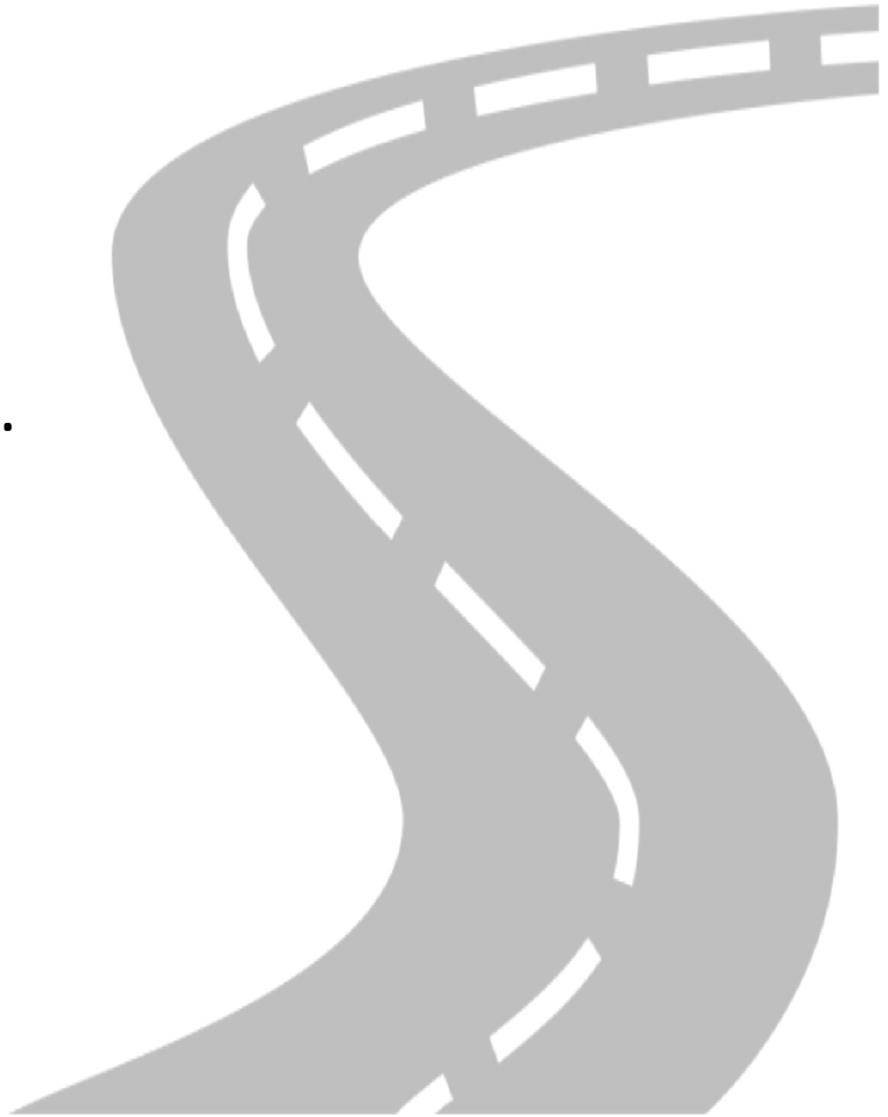
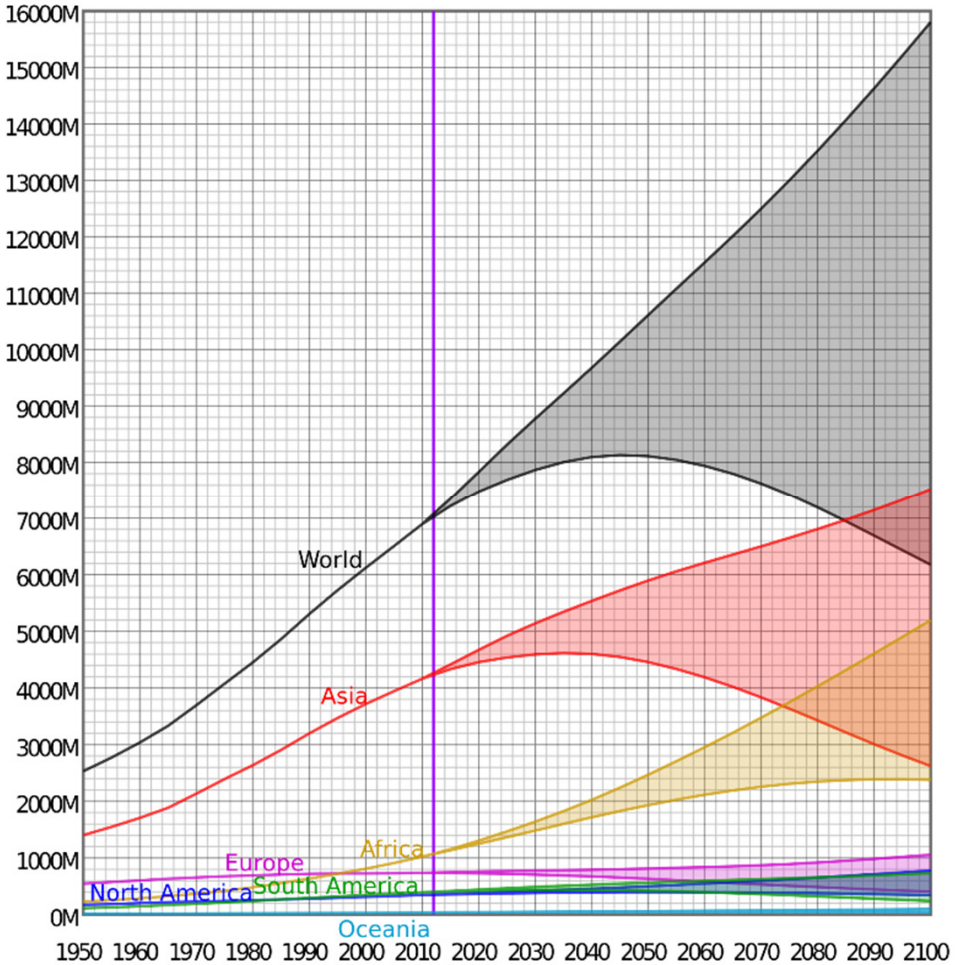
Outline

- Start of a journey
- Current view
- ‘Road works’ related to...
  - sustainability
  - health
- Road ahead...

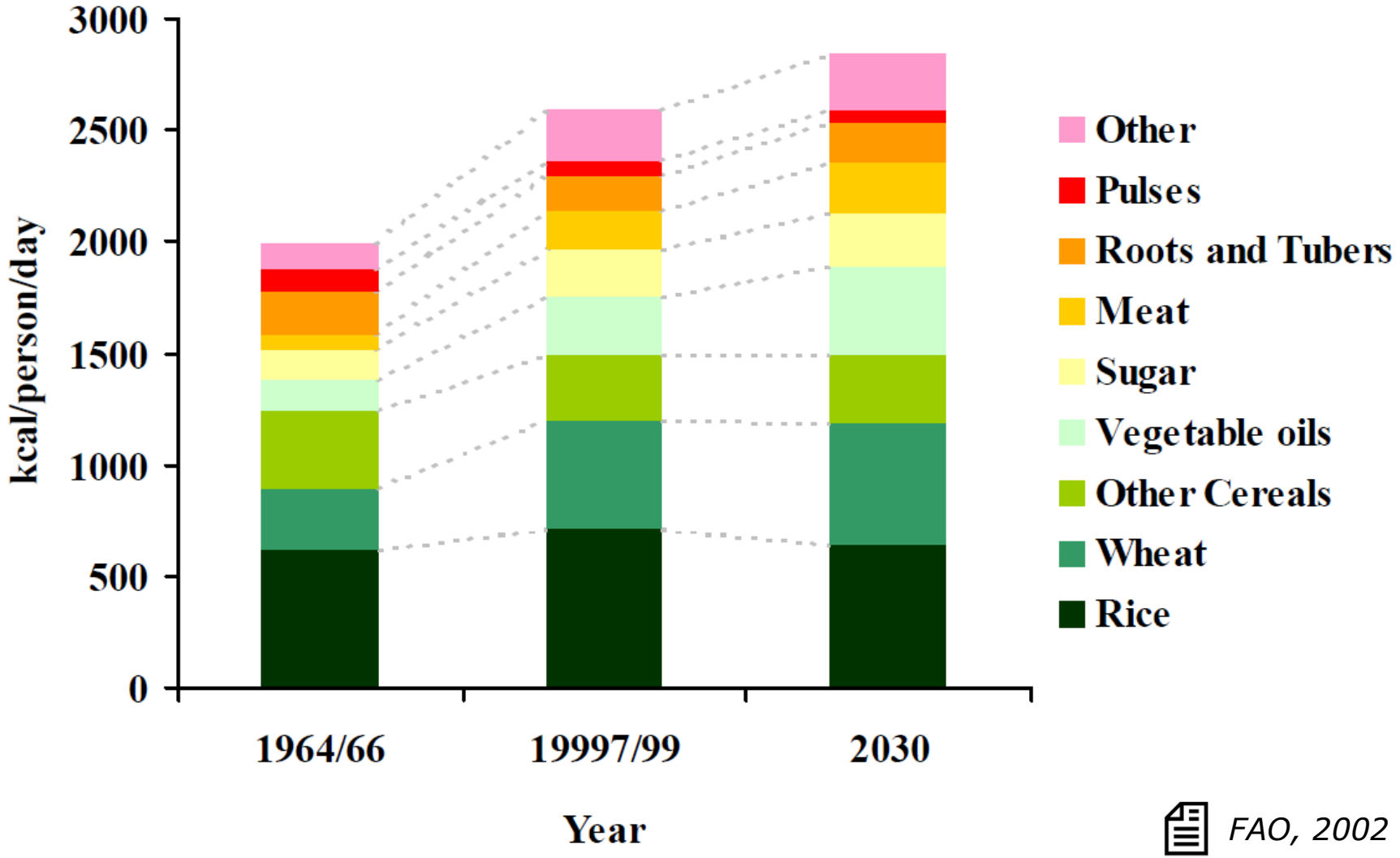


Why healthy & sustainable diets?

- Increasing demand of foods
  - growing population
  - new economies



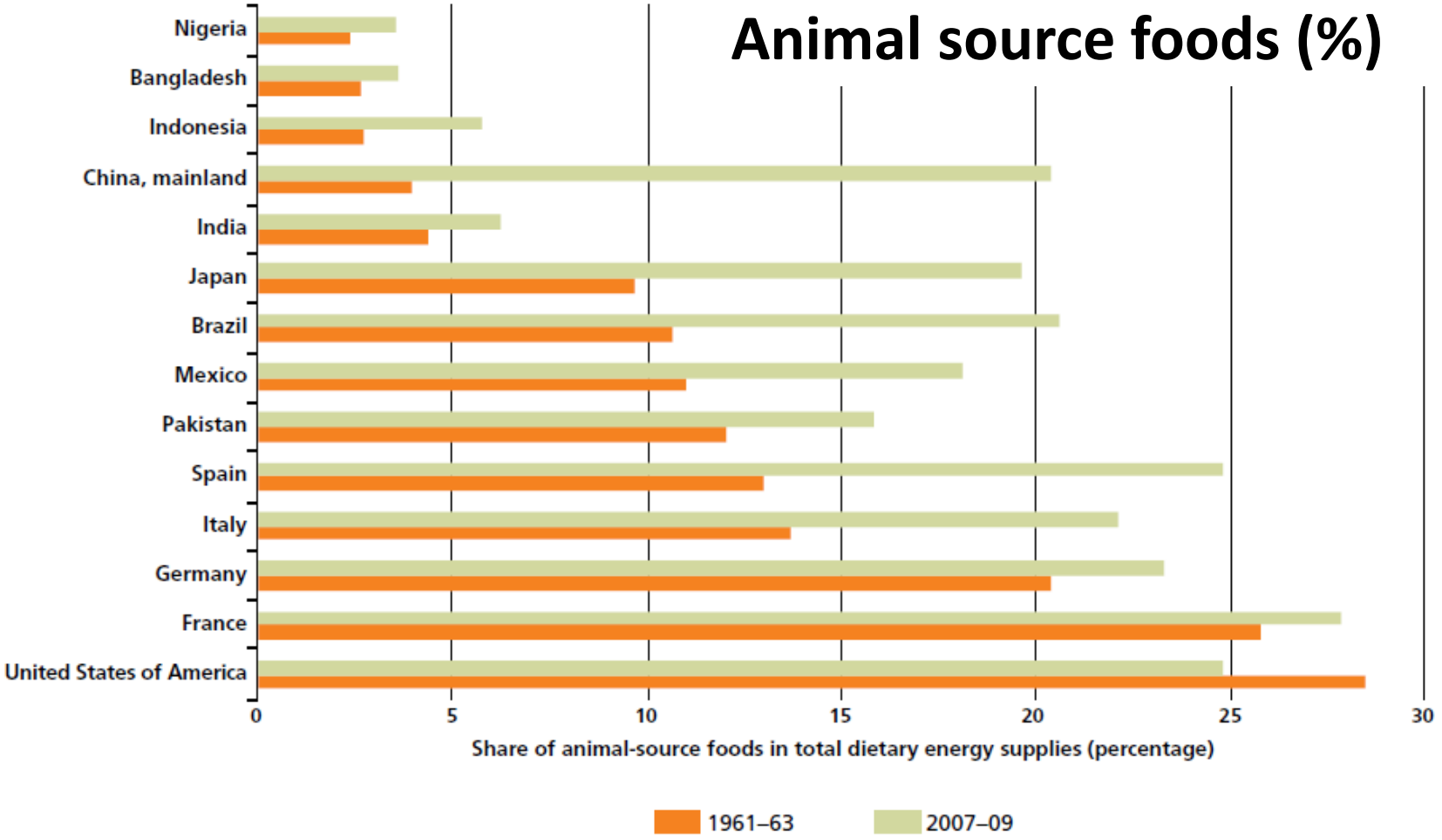
Global progress in food consumption



FAO, 2002

FIGURE 12

Diets are converging towards an overall higher share of animal-source foods in most countries with fast economic growth



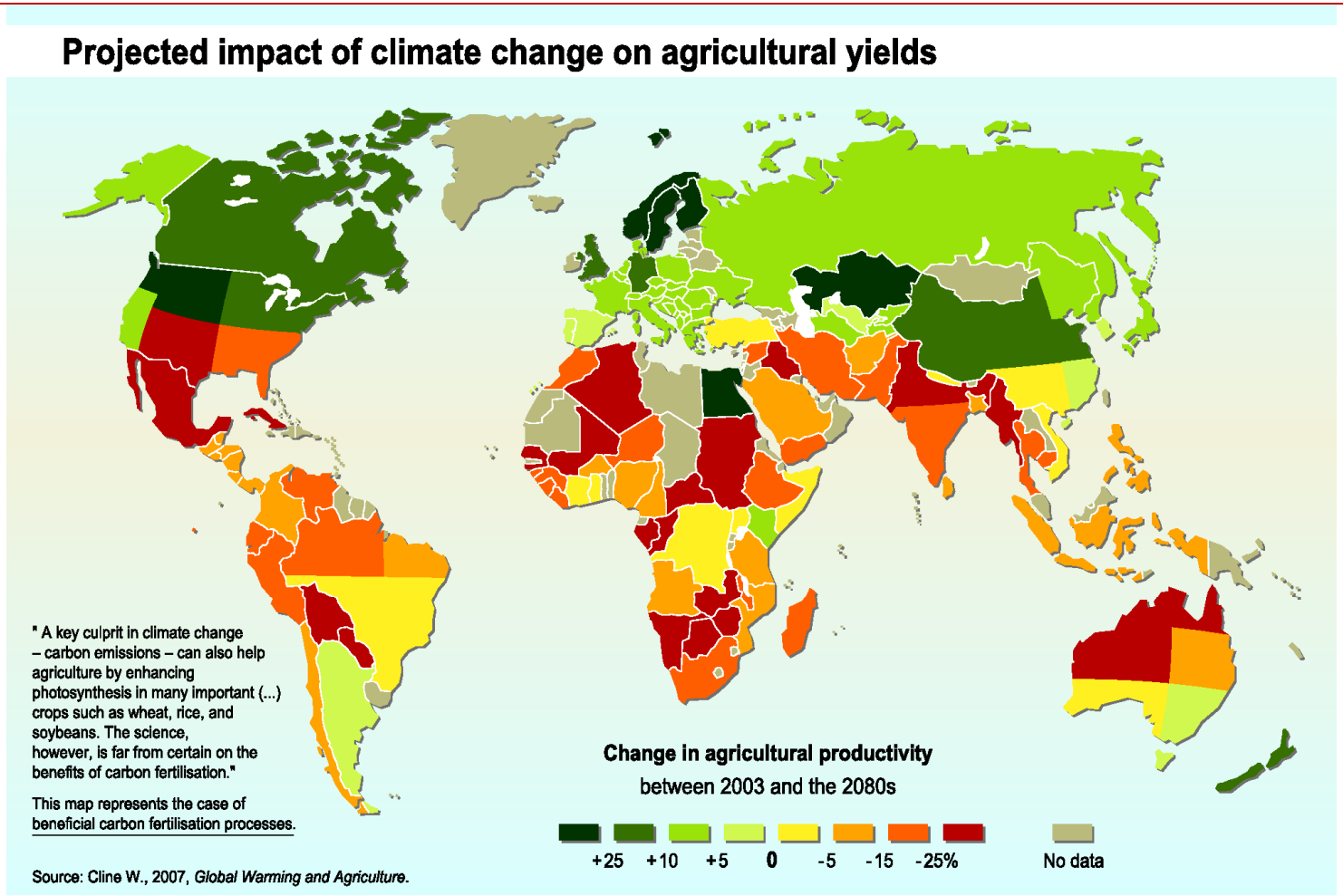
Source of raw data: FAO.

Why healthy & sustainable diets?

- Increasing demand of foods
  - growing population
  - new economies

- Environmental concerns
  - competing interest for arable land (food, feed, fuel)
  - food consumption: 15-28% greenhouse gas emission (GHGe) *(Garnett, 2011)*

Production shift to ‘the North’



Why healthy & sustainable diets?

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- Environmental concerns
  - competing interest for arable land (food, feed, fuel)
  - food consumption: 15-28% greenhouse gas emission (GHGe) *(Garnett, 2011)*

- Access to safe and nutritious food in not guaranteed for all consumers
  - age, sex, SES, regions

Nutrition ‘security’ for all?

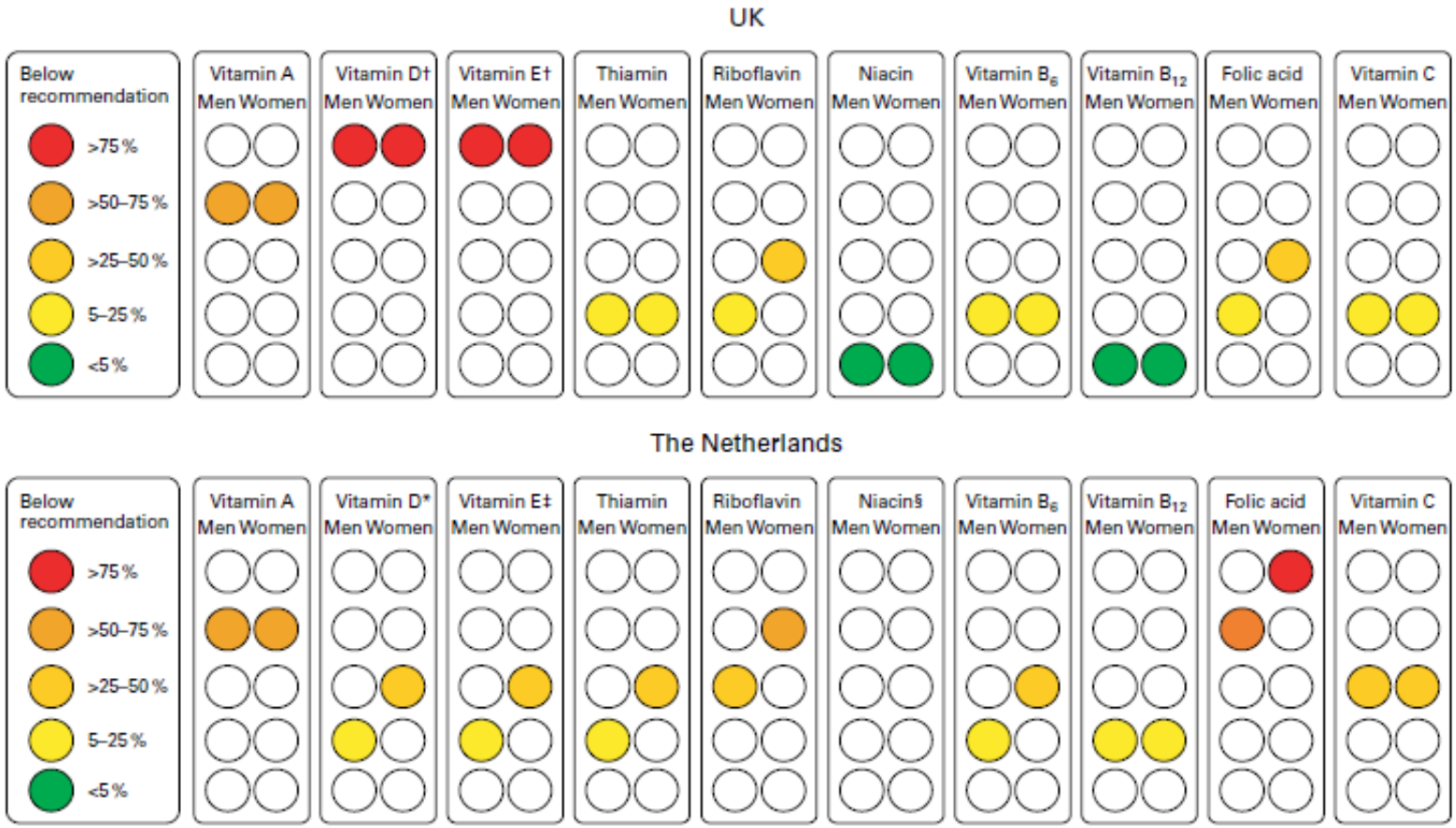

Fig. 1. Population with intakes below the specific recommended reference value for the country[16–25]. The level of recommendation covering the needs of 97·5% of the population was used where it existed. * Average nutrient requirement/approximation. † No references exist, therefore, the Institute of medicine reference was used. ‡ > 25–50 % for men aged 19–30 years. § Data not available.

Troesch, Br J Nutr 2012

Sustainable and healthy diets

are...

- protective and respectful of biodiversity and ecosystems,
- culturally acceptable
- accessible, economically fair and affordable
- nutritionally adequate, safe and healthy

...while optimizing natural and human resources (FAO, 2010).

Diets

Sustainable and healthy diets

are...

- protective and respectful of **biodiversity and ecosystems**;
- culturally acceptable;
- accessible, economically fair and affordable;
- nutritionally adequate, safe and healthy;

...while optimizing **natural and human resources** (FAO, 2010).

Environment

Sustainable and healthy diets

are...

- protective and respectful of biodiversity and ecosystems,
- **culturally acceptable**
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- **nutritionally adequate, safe and healthy**

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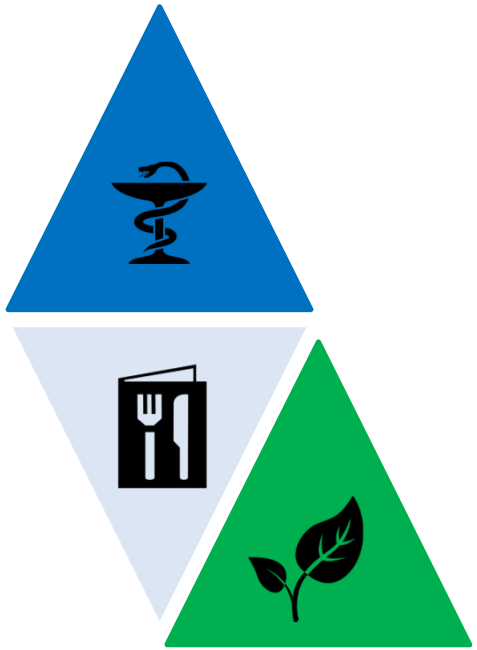


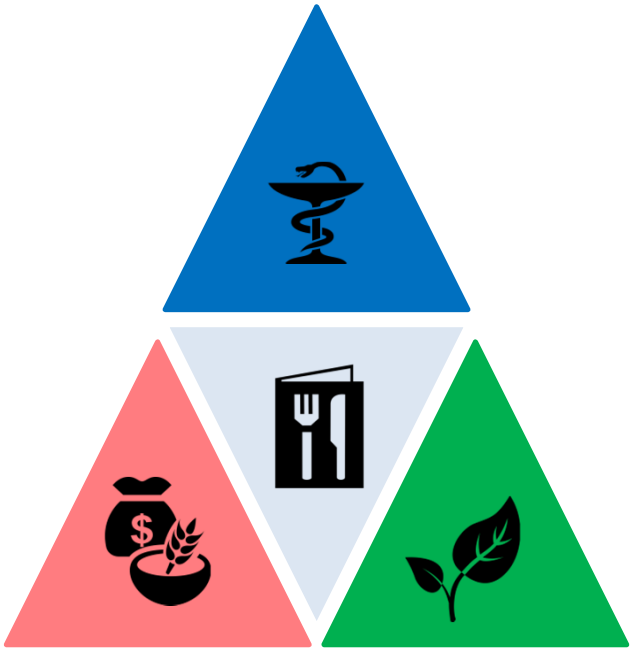
Health

Sustainable and healthy diets

are...

- protective and respectful of biodiversity and ecosystems,
- culturally acceptable
- **accessible**, **economically fair** and **affordable**
- nutritionally adequate, safe and healthy

...while optimizing natural and human resources (FAO, 2010).



Economy

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- Road ahead...

Systematic review

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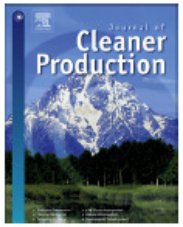

Review

Environmental impact of dietary change: a systematic review

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ABSTRACT

Global food production is identified as a great threat to the environment. In combination with technical advances in agriculture, dietary change is suggested to be necessary to reduce the environmental impact of the food system. In this art
change is performed. The aims
timate the potential environn
importance for outcome and
reviewed journal articles asses
narios. The results suggest that
reaching environmental goals,
associated with the current d
scenario development and acc
major influence on the quality
change as a measure for more sustainable food systems requires improved knowledge of uncertainty in dietary scenario studies, environmental impact from substitutes and complements to meat and the effect of dietary change in different groups of populations and geographical locations.

14 publications

- GHGe (n=12)
- land use (n=4)

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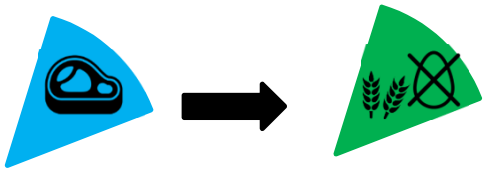
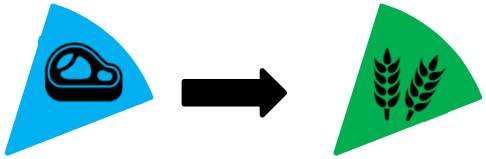
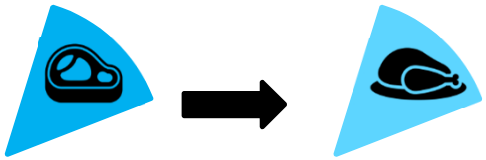
Summary

		*GHGe reduction **	*Land use reduction**
Vegan diet		**25-55%** (n=6)	**50-60%** (n=3)
Vegetarian diet		**20-35%** (n=9)	**30-50%** (n=2)
Red meat → white meat		**20-35%** (n=2)	**-**

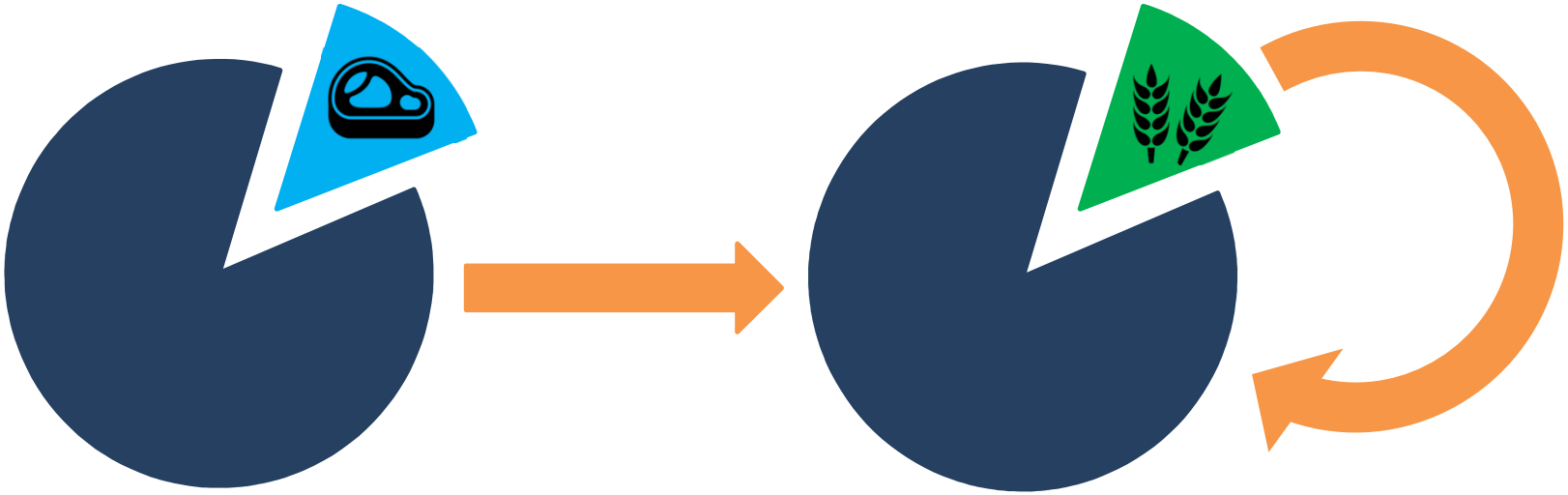
**compared to reference scenario (=current diet)*

Hallström, 2015

Key message - current state

Plant based diets (vegan) have most potential to reduce GHG emissions and land use *(based on current data)*

Food replacement



Scenario's: meat → plant

- *equal energy (kcal)*
- *equal weight (g)*
- *equal protein weight*
- *which plant foods unclear*

Assumptions

- remainder of diet/foods stays the same
- less meat is healthier
- diets shifts are acceptable for consumers

Food pattern replacement

Scenario's: meat → plant

- *equal energy (kcal)*
- *equal weight (g)*
- *equal protein weight*
- *which plant foods unclear*

Pattern replacement (=complex)

- total diet shift (meals, menu's)
- nutritional adequate for all nutrients
- acceptable for consumers
- sustainability indicators for all foods and other indicators

Key message - diet

Food item replacement is to simple. We should focus on whole diets or **dietary patterns**

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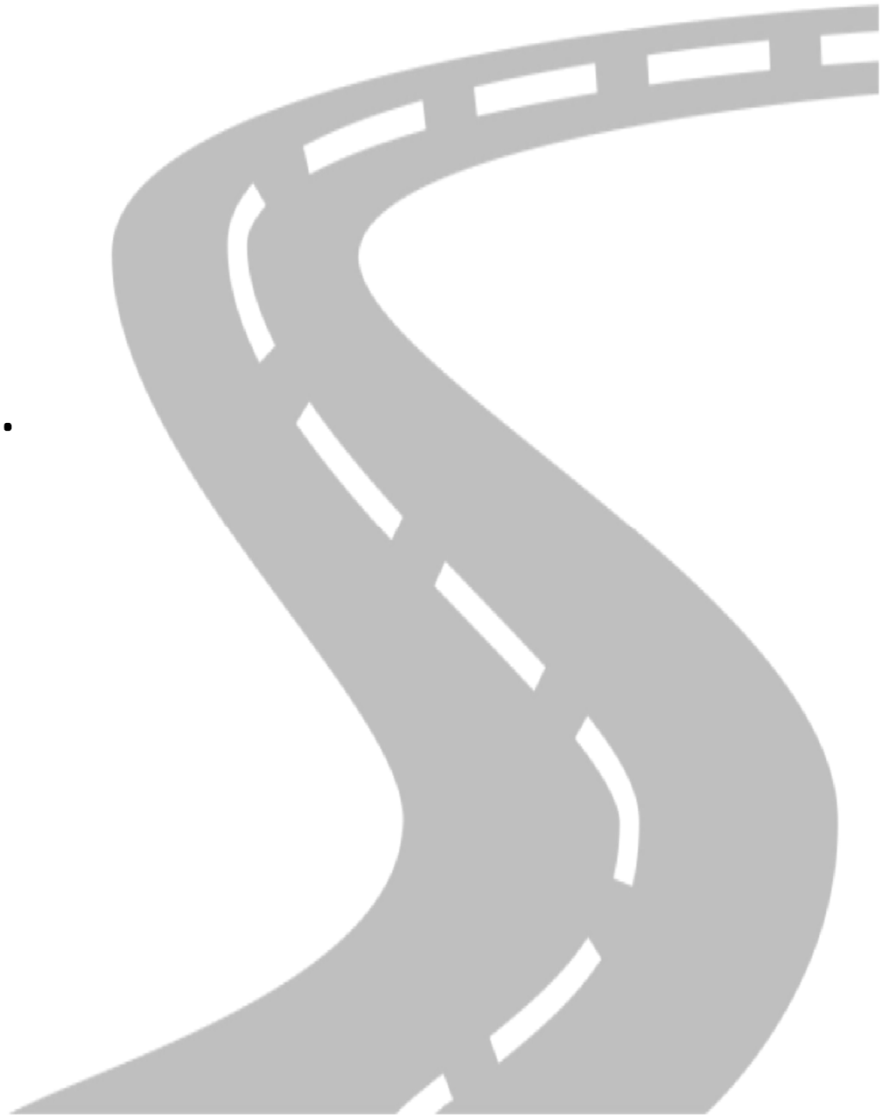
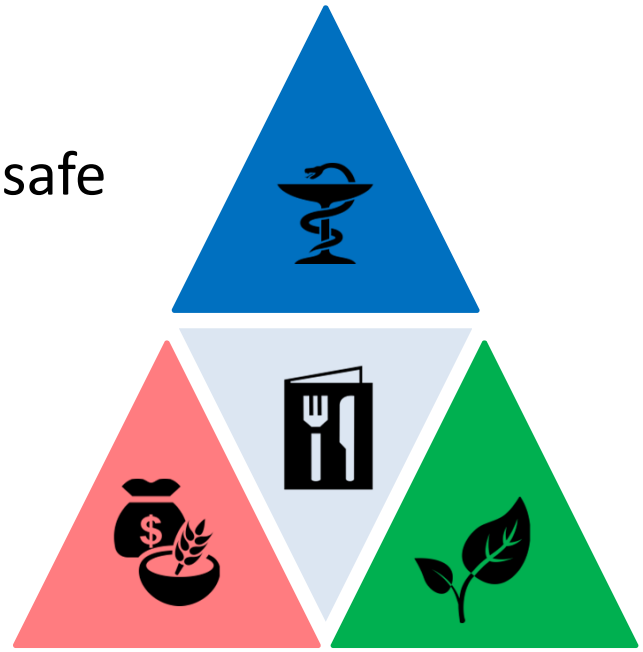


‘SHARP’ diets

2) Health

Nutritious & safe



1) Environmentally sustainable production chains

3) Consumer friendly

affordable, reliable & palatable

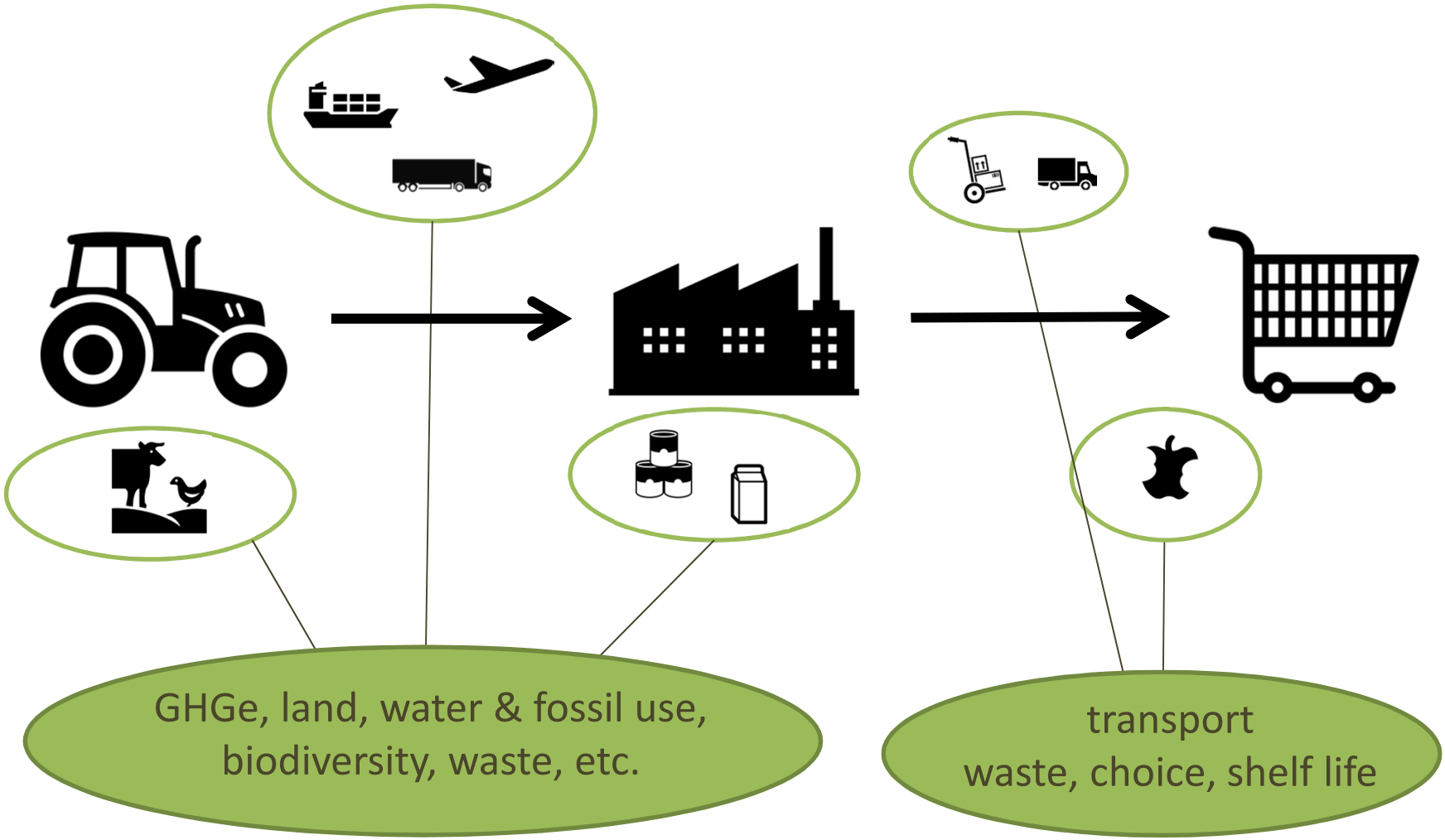
Sustainable, **H**ealthy, **A**ffordable, **R**eliable, **P**alatable

Sustainability indicators

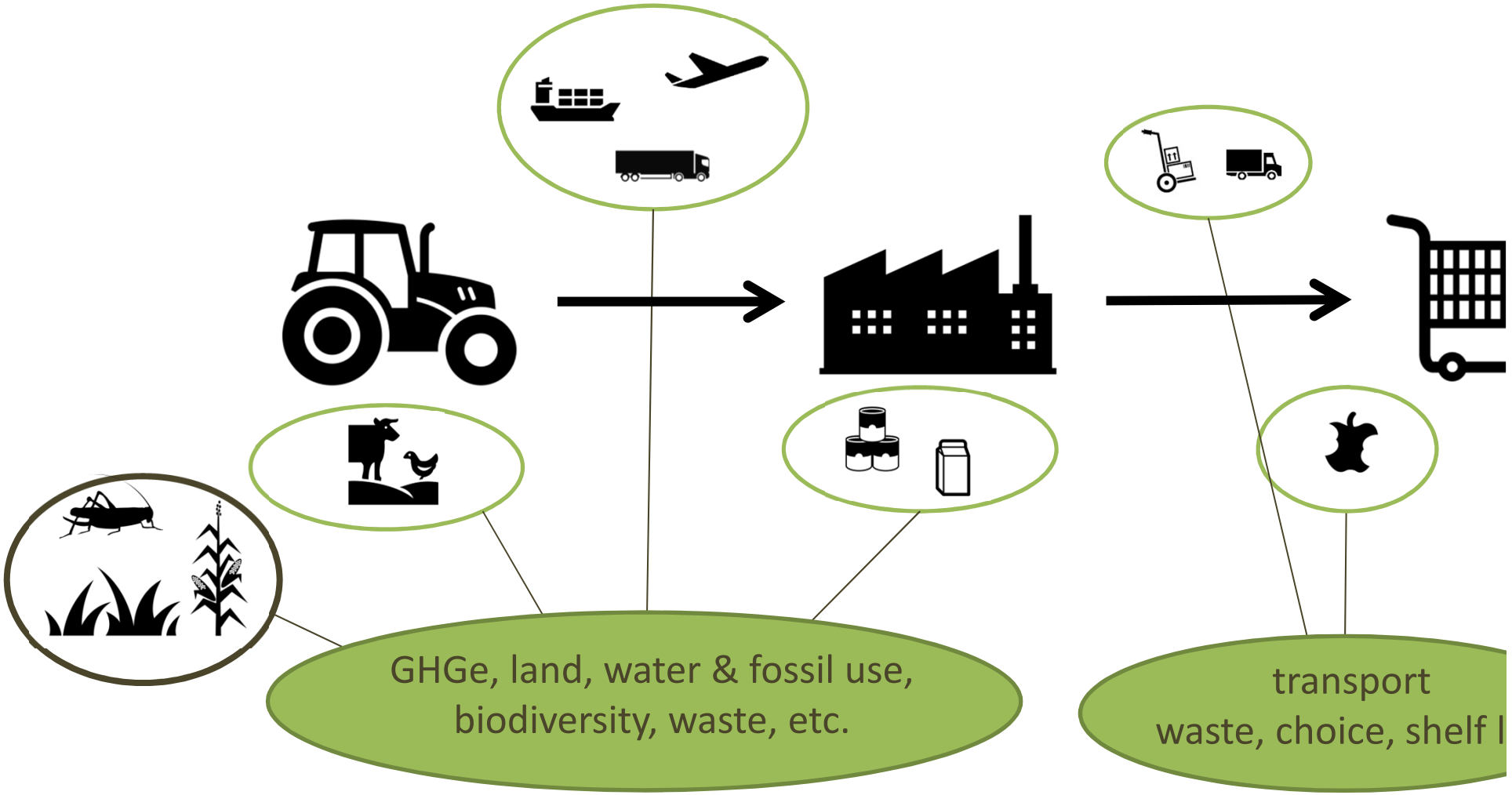
- **Greenhouse gas emissions** (GHGe) available for limited percentage of food items.
  - ranged from **9-391 food groups** or items.
  - comparison, UK and US, nutrient composition tables based on content of **~5000 foods consumed**
- Land use
- Water footprint
- Ecosystem quality, biodiversity
- Eco-toxicity
- Acidification
- Eutrophication

Auestad, 2015

Sustainability indicators



Sustainability indicators



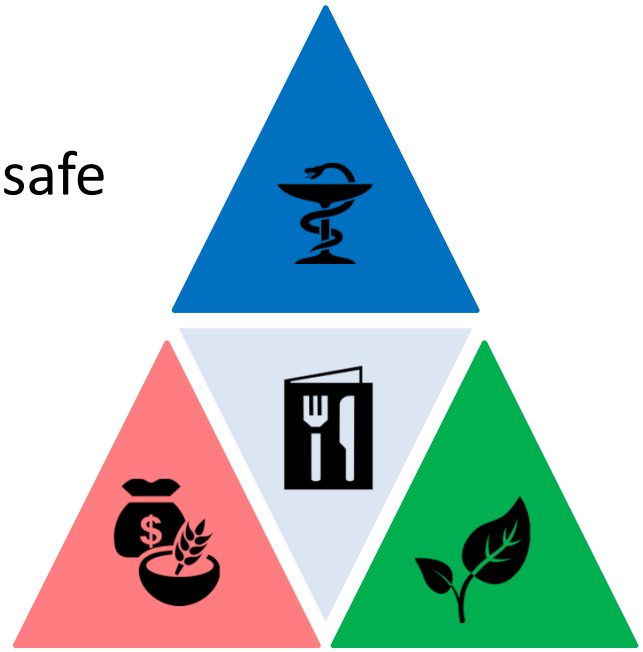
Key messages - sustainability

- Need to develop **other sustainability indicators** and/ or integrated summary measures
- **Life cycle assessment (LCA)** over the entire food chain
- Need to develop sustainability indicators for **more food products**

‘SHARP’ diets

2) Health

Nutritious & safe



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Healthy nutrition

Five rules (‘Schijf van vijf’)

- Eat varied
- Don’t eat too much & exercise
- Eat less saturated fat
- Eat vegetables, fruits & bread
- Eat safe

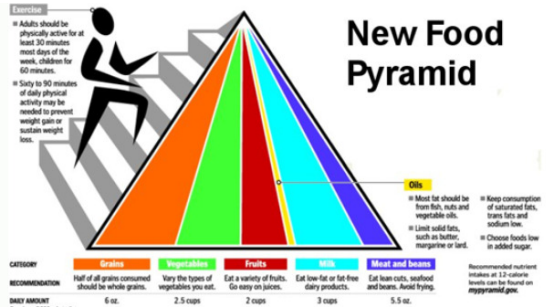
Science (research)

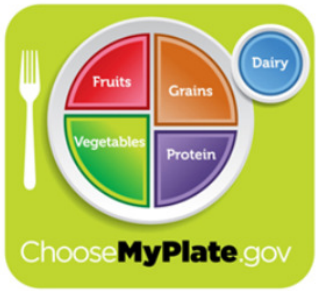
↓

Health council (Guidelines)

↓

Nutrition Centre (5 rules)





Healthy nutrition - indicators

Usual food consumption, in such a way that:

- no **increase of disease risk** (integrated measurements such as DALYs, food "healthy diet scores")
- no **malnutrition**: adequate supply of nutritional substances, in right proportions (NIVs, under usual reserve 'proof' of research, expert committees)
- **over consumption**: healthy weight, hunger and satiety, physical activity (functional measurements, not guaranteed by the NIVs)
- for most of the population, including **vulnerable groups** (stages in life cycle, socio-economic)

How to determine? Science → Health council → consumers organisations (expert-driven, transparent, NIVs international, Food based dietary guidelines country specific)

Healthy nutrition – criteria (WHO)

Fat	• total fat < 30% of total energy intake • saturated fats → unsaturated fats • eliminate industrial trans fats
Carbohydrates	• Free sugars < 10% of total energy intake • < 5% for additional health benefits.
Salt	• <5 g per day helps prevent hypertension and reduces the risk of heart disease and stroke in adult population
Goals WHO Member States (2025, world)	• reduce population's intake of salt by 30% • halt the rise in diabetes and obesity by 2025

(accessed April 2015: http://www.who.int/mediacentre/factsheets/fs394/en/)

Healthy nutrition >> energy & nutrients

Food >> nutrients: apple >> applesauce >> apple juice
physiological effects of non-nutrients and food matrix, unconscious learned responses to chew, swallow, taste, smell, associations with environment, society, etc.

Human body >> protein + fat + carbs + iron + trace elements + vitamins;

Health >> "absence of sickness" means the physical, social and mental well-being, health is "resource for living" or "ability to live a healthy and productive live"

Total = sum of the parts + complexity

(interactions are lost through simplification for the sake of scientific method)

Vision JPI ‘healthy diet for a healthy life’

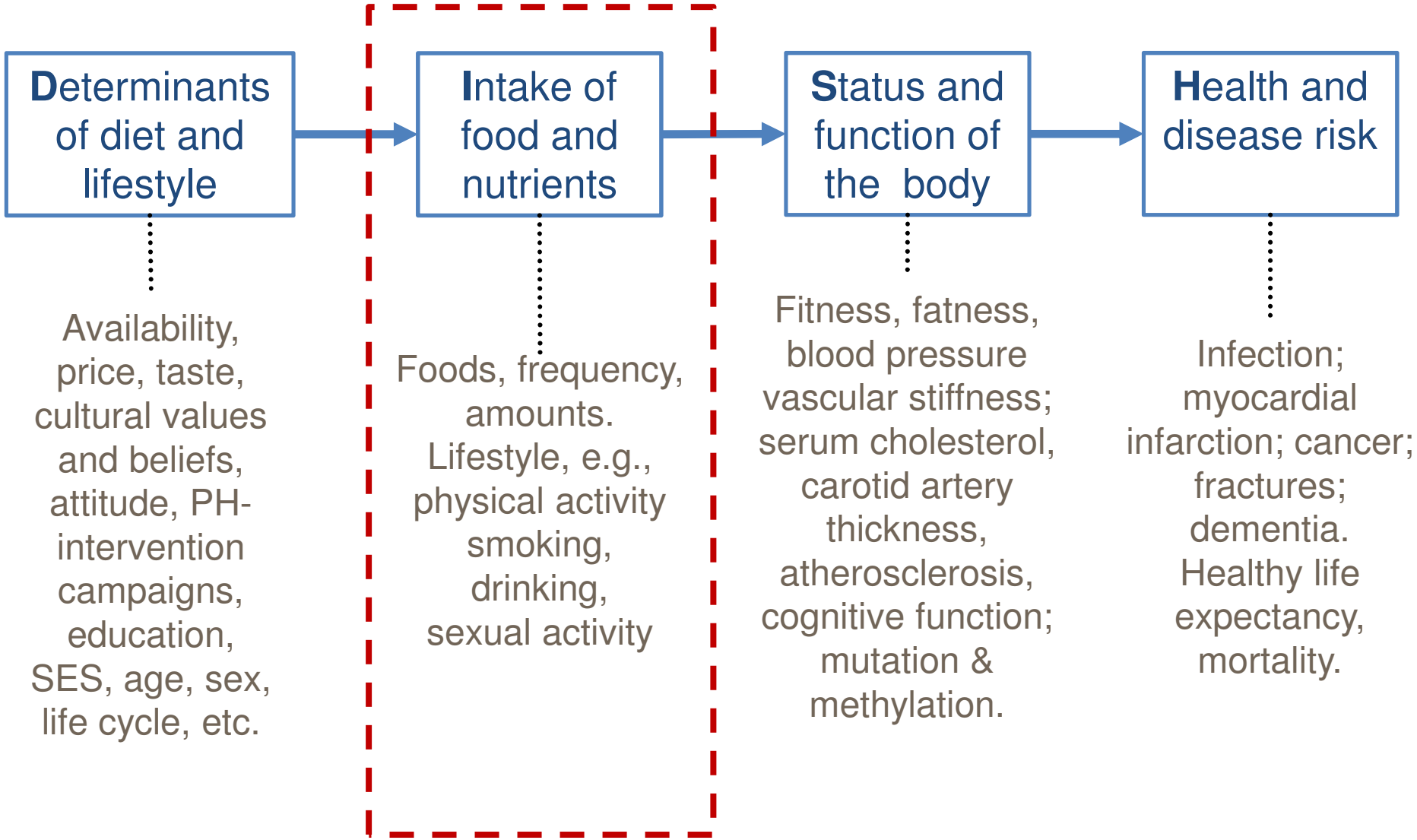
JPI = Joint Programming Initiative

By 2030: all Europeans have the motivation, ability and opportunity to consume “A healthy diet from a variety of foods, healthy levels of physical activity and diet-related diseases have decreased significantly”.

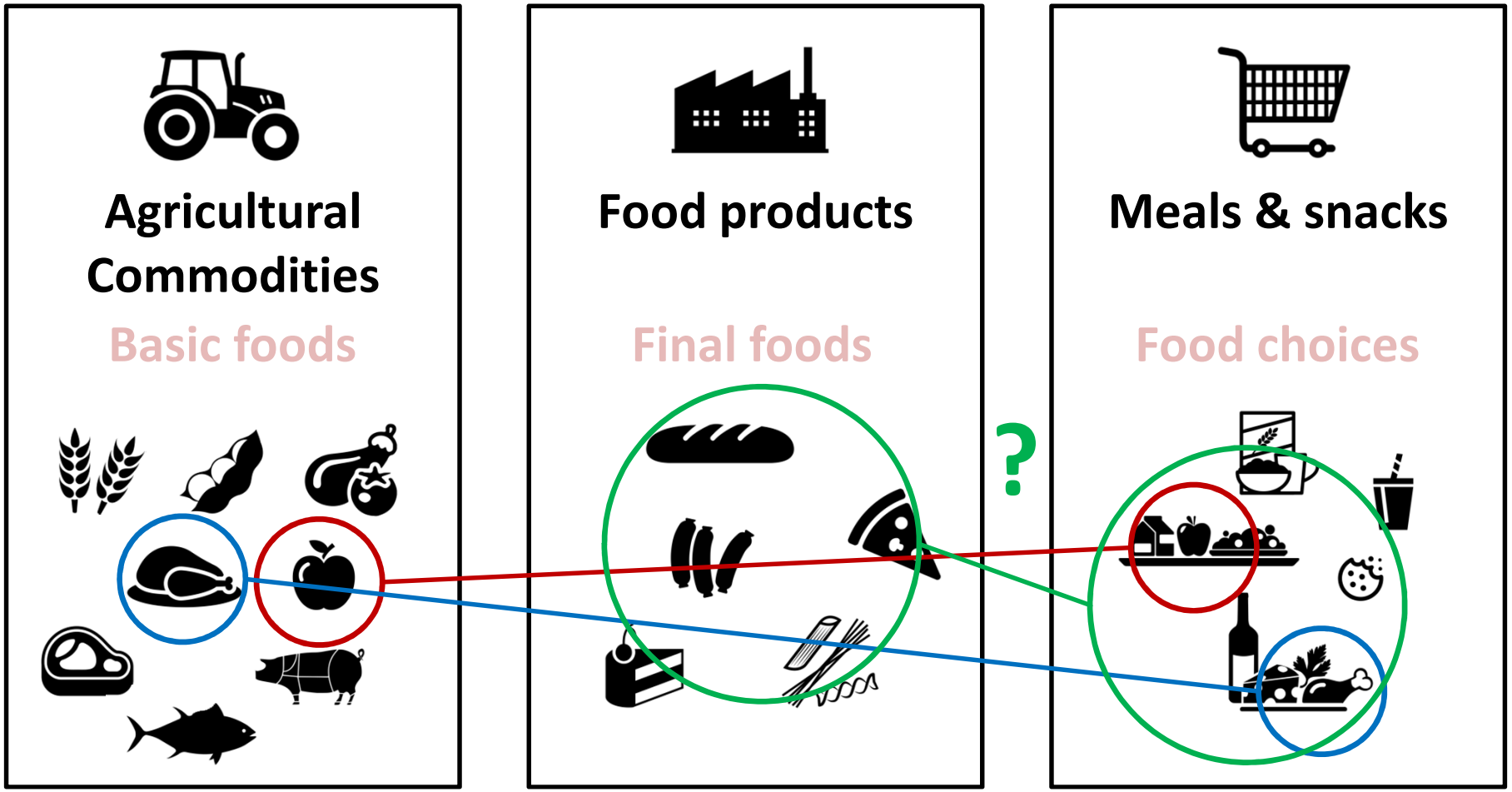
Research area next to “Aetiology” and “Prevention”:
- Diet and food production: developing high-quality, healthy, safe and sustainable food products.
- The challenge is to stimulate the European **consumers** to select foods that fit into a healthy diet and to stimulate the **food industry** to produce healthier foods in a sustainable way.

(JPI HDHL The vision for 2030 http://www.healthydietforhealthylife.eu/index.php/hdhl-documents/key-documents)

Health indicators -science



Foods in supply chain



Indicators: Matching products

Sustainability grouping

- Commodities
- Half products
- End products
- Composite products

Focus on footprints and Life Cycle Analysis (LCA)

Nutritional grouping

- 5000 items in food data bases
- ± 1500 in 24 h recalls
- ± 150 in FFQ
- 75 sub groups (EPIC Soft); 17 main groups

Focus on energy and nutrients

Key messages - nutrition

- **Health is more** than adequate intake of **energy and nutrients**
- Different **levels of aggregation** for foods (agricultural commodities vs food products) exist. Input is needed to integrate both.
- Need to calculate sustainability for **multi-ingredient food products**

Summarize ‘SHARP’ diets

Sustainable, **H**ealthy, **A**ffordable, **R**eliable, **P**alatable

1) Environmental sustainable diet – JRC/ literature

- use of different sustainability indicators
- for more food items

2) Healthy diet (WHO) – based on individual food records/ FFQ

- Adequate nutrient requirements
- Reduction of saturated fats, salt, sugar

3) Consumer friendly – based on individual food records/ FFQ

- diet patterns (meals and snacks), cultural differences
- include food prices (affordable)

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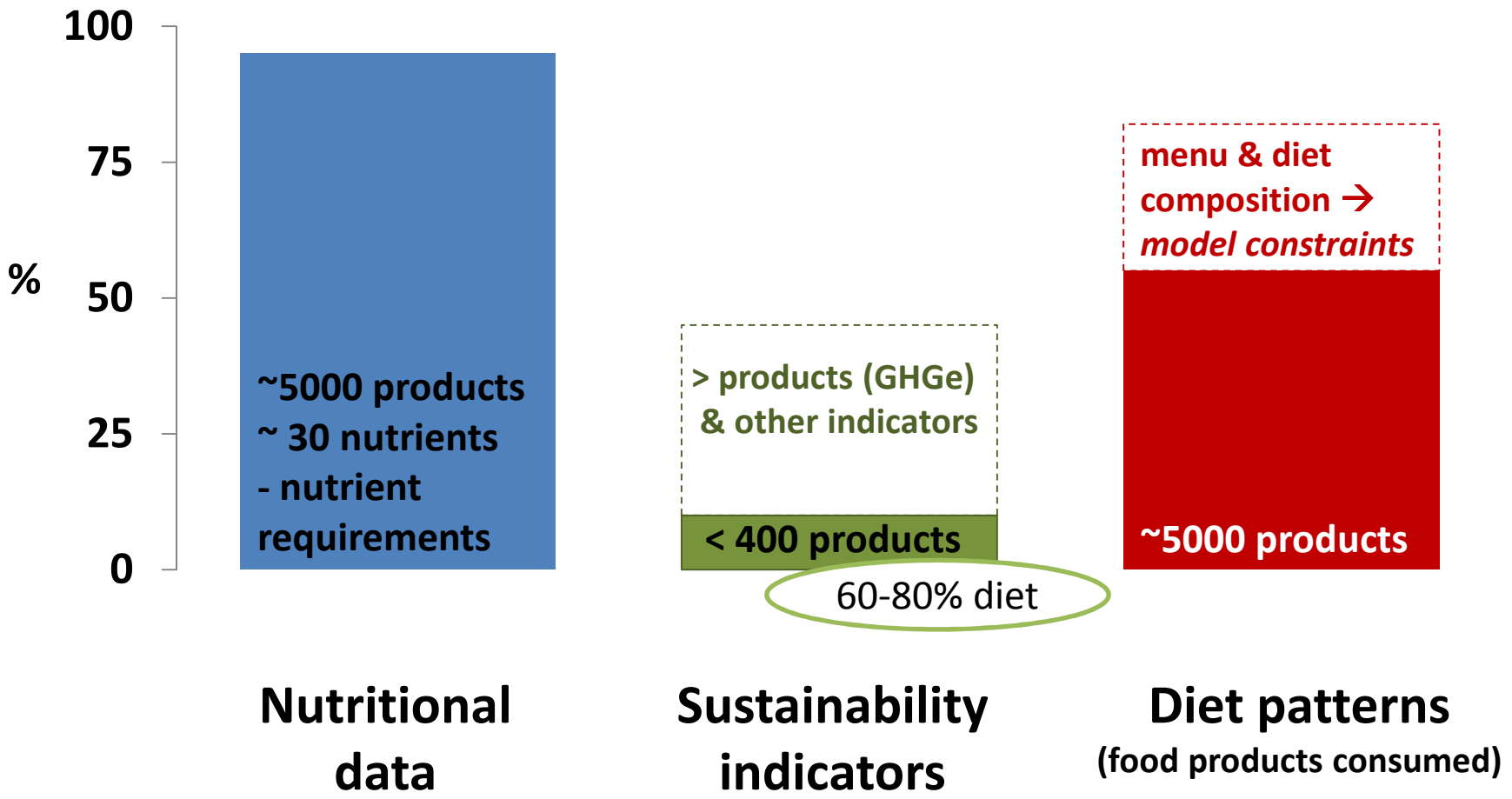
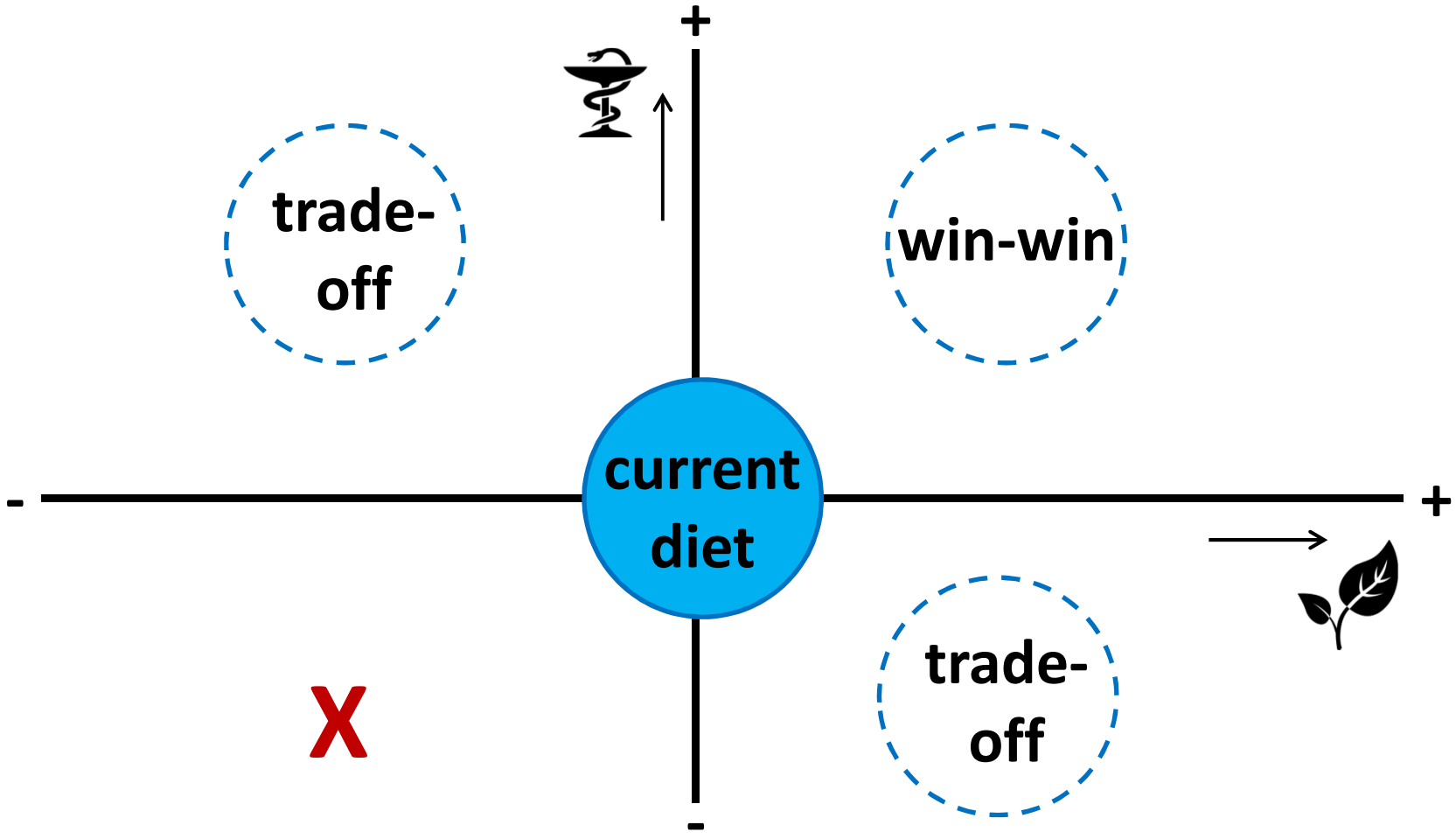
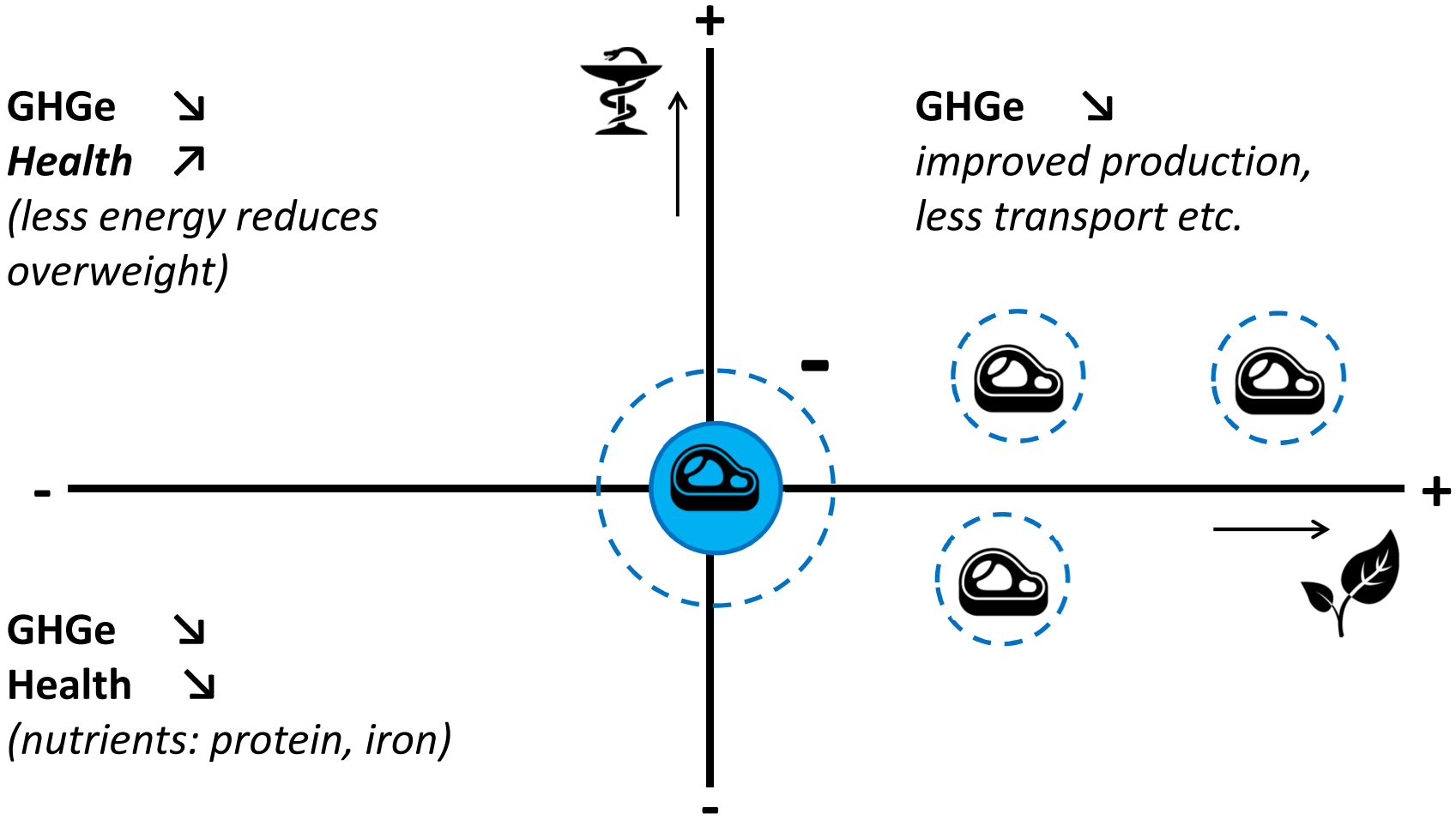
Availability data



Example

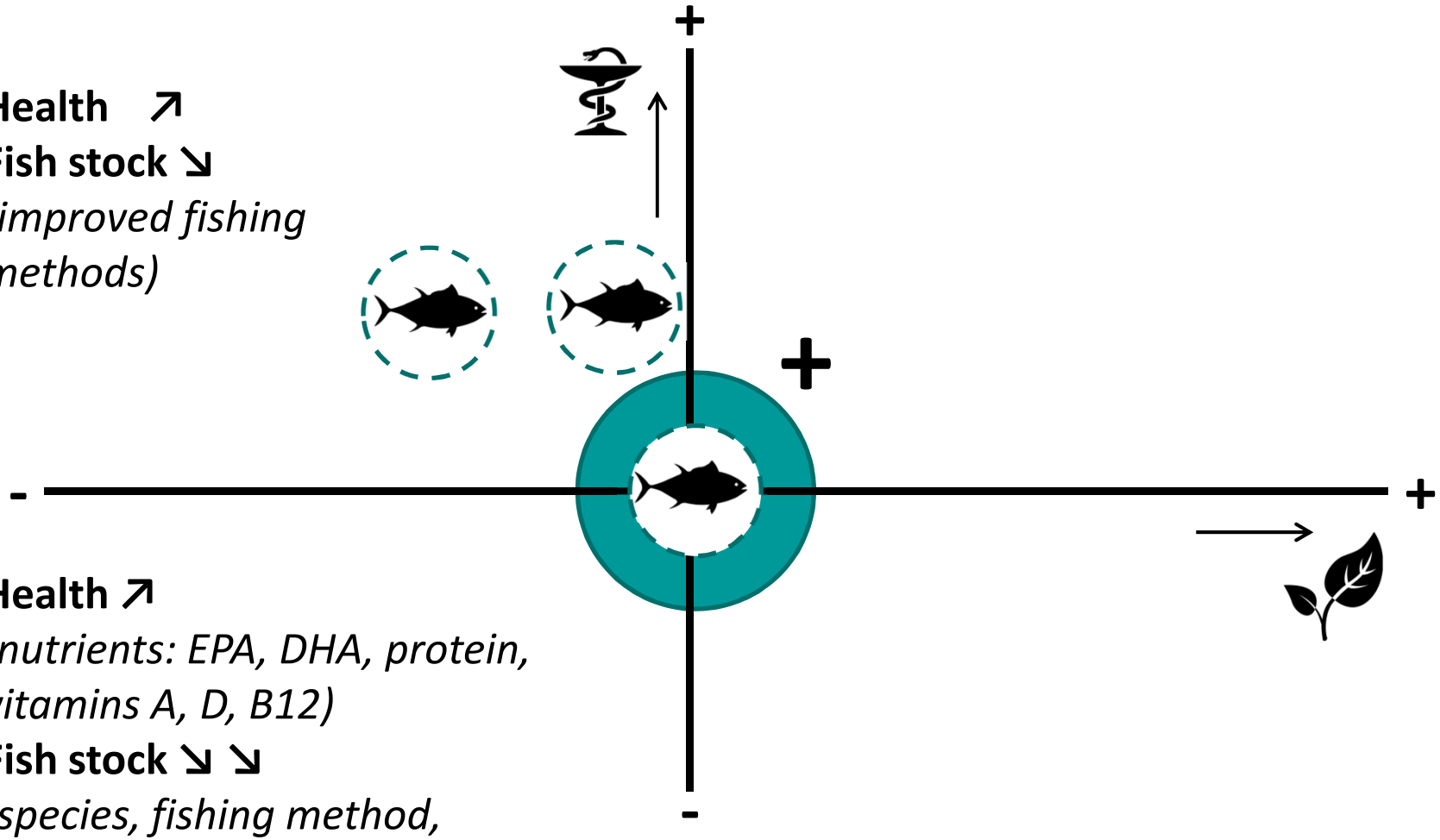


Example: meat



Example: fish

Health ↗
Fish stock ↘
(improved fishing methods)



Health ↗
(nutrients: EPA, DHA, protein, vitamins A, D, B12)
Fish stock ↘ ↘
(species, fishing method, origin, by-catch)

WU-part in SUSFANS

Modelling optimal diets:

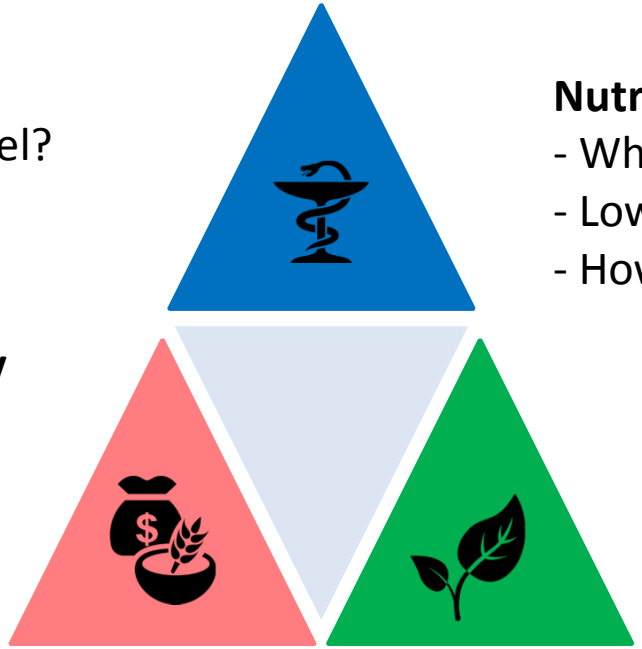
Based on individual assessments of current dietary intake

- to model **S**ustainable diets (indicators for food products)
- and **H**ealthy diets (nutritional adequacy)
- for consumers that are **A**ffordable (food prices), **R**eliable, and **P**alatable (dietary patterns)

Modelling using MILP

How sustainable is a healthy diet?

Foods
- Which foods?
- Aggregation level?



Nutrients
- Which nutrients?
- Lower and upper limits?
- How to quantify (weighing)?

Palatability and affordability
- combination of food items
- food prices

Sustainability indicators
- single measures
- integrated measures
- region, production method

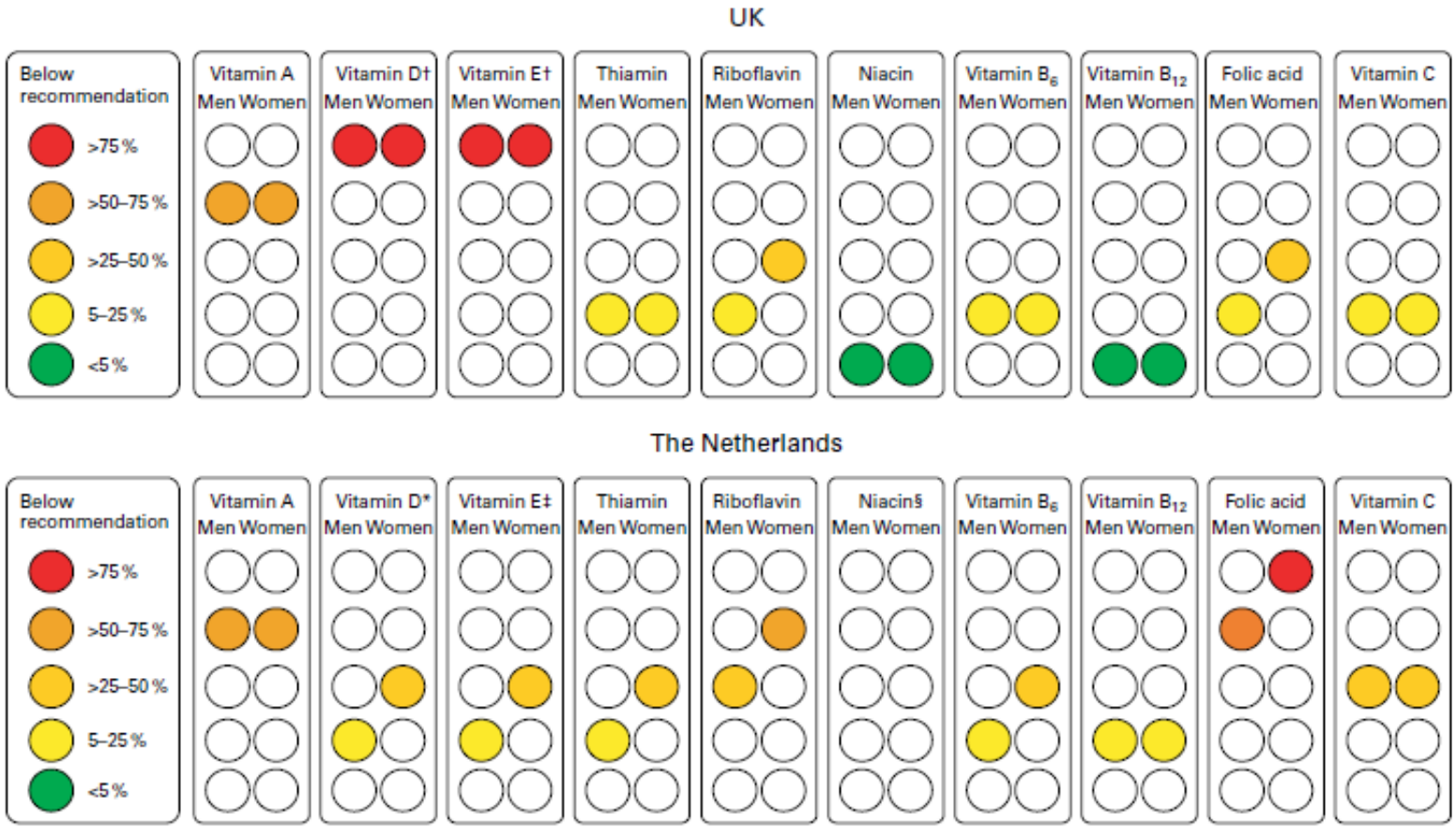
Cultural differences
- 4 countries (regions)
- subgroups (age, sex, SES)

How healthy is a sustainable diet?

Outcome modelling

- optimal diets for different sets of Nutrition/Health criteria
- optimal diets for different sets of sustainability criteria
- identification of risk groups (age, sex, country, SES)

Vitamin intakes vs recommendations



Sustainability → Diet composition → Vitamin intake

Troesch, Br J Nutr 2012

Outcome modelling - industry

Modelling with sustainability, nutrient and menu constraints will lead to:

1) **diet shifts** => food product shift

- shifts in production
- product innovation

2) will reveal **limiting nutrients** for specific **subgroups**

(age, sex, country, SES)

- product reformulation, supplementation

*For **total diet** outcomes will be on a higher aggregation level;*
*For **case-studies** outcomes will be more detailed.*

Key messages - modelling

- There is **not 'one'** optimal healthy and sustainable diet!
  Depending on stakeholder interests, accessibility indicators, preferences, etc.

- We use **current data** (food intake, diet pattern, sustainability indicators). **Different data will lead to different outcomes!** *(product innovation, processing, technology, production changes, etc.)*

- A lot is unknown about **consumer behaviour**
  Need for insight in drivers of behaviour towards healthy and sustainable diets (develop indicators)

Thanks

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Hans van Meijl (LEI)
Industry (NZO, Unilever, DSM)

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